CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter will described about the procedures of designing bicycle frame and analysis of material for the frame. Research methodology is a set of procedures or methods used to conduct research. Methodology is needed for a guideline in order to ensure the result is accurate based on objective. There are several steps need to be followed to ensure the objective of the research can be achieve starting from finding literatures until submitting the final report.

3.2 Flow Chart of Methodology

Flowchart is represents a process by showing the steps as box of various kinds, and their orders by connecting with arrows. Flowchart is important in doing research by helping viewer to understand a process flow and help to visualize what is going on. Flow chart methodologies were constructed related to the scope of product as a guided principal to formulate this research successfully, in order to achieve the objectives of the project research. This is important to ensure the research experiment is on the right track. The terminology of work and planning for this research was shown in the flow chart below.

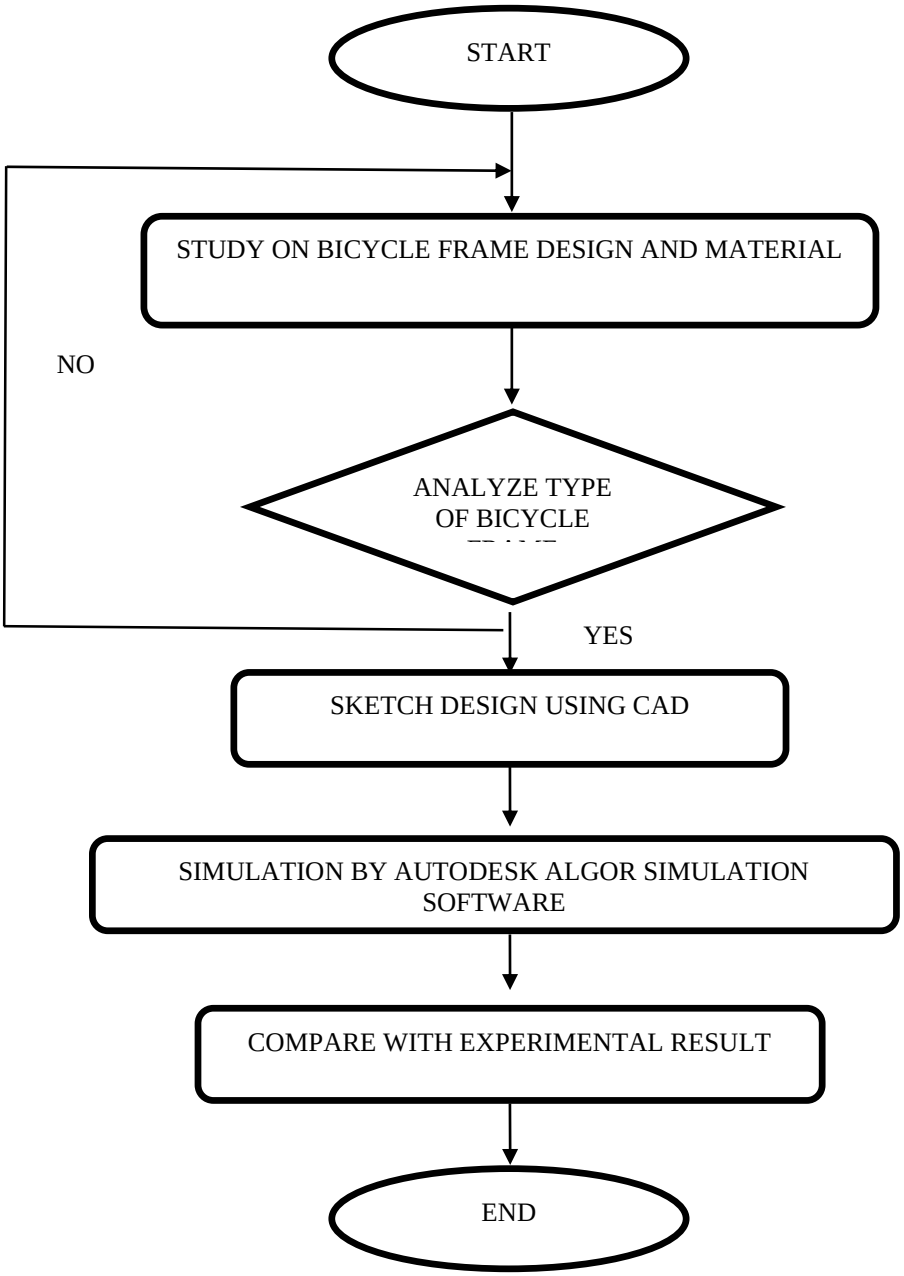

Figure 3.1: Project flow chart

3.3 Design of Bicycle Frame

The design of the frame will be using the diamond shape frame. There will be two different shape of bicycle design which are tube frame design, shown in Figure 3.2 and ellipse frame design shown in Figure 3.3. The diamond shape frame were choose because it was widely compare to other type of frame. Besides that, this frame were easily made compare to others which give an advantage for a mass production.

Figure 3.2: Tube frame design

Figure 3.3: Ellipse frame design

3.4 Material Selection

The material that will be in the analysis are aluminium alloy and titanium alloy. These material will be define to the bicycle frame in the Autodesk Algor Simulation software. Table 3.1 below shows the properties of both material

Table 3.1: Properties of analyse material

Material	Aluminium Alloy 2014 T6	Titanium Alloy 6Al-4V
Modulus of Elasticity (GPa)	75.152	113.763
Mass Density (g/cc)	2.789	4.382
Poisson's Ratio	0.4	0.35